OTHER NON-ALUMINUM

AD-126 Magnesium

During 1983 a minimum effort was devoted to determine the feasibility of utilizing ARCO Chloride Technology for producing anhydrous $MgCl_2$ with a specification similar to $AlCl_3$. If such $MgCl_2$ could be produced, it would be electrolyzed in an Alcoa bipolar cell that would result in the electrical energy consumption about the same as for aluminum which is about a 25 to 33% savings over current magnesium processes.

Magnesium hydroxide [$Mg(OH)_2$] was dissolved in concentrated HCl to produce magnesium chloride hexahydrate (MCH). The MCH solution was gas sparged to precipitate solid MCH. The solid MCH was then calcined to produce a maximum in chlorine to hydrogen ratio. This material is termed PCMCH.

Thermodynamic calculations were performed to determine the experimental conditions for converting PCMCH to an anhydrous $MgCl_2$ with less than 0.03 wt % oxides. Thermodynamics project PCMCH can be calcined in ≥ 3 atm HCl to produce the desired $MgCl_2$. Carbochlorination can also convert PCMCH to anhydrous $MgCl_2$ but separation will be a problem due to the low vapor pressure of $MgCl_2$. Traditionally a solid liquid separation must occur, however, the solubility of oxides in the liquid anhydrous $MgCl_2$ may present a problem in meeting the oxide content specifications required for the bipolar cell. The 1984 program will involve experimental investigations to determine the feasibility of producing $MgCl_2$ with less than 0.03 wt % oxides.